

Engineering Management in Kosovo

Hajrizi, E.*; Kopacek, P.**

*University for Business and Technology, Lagjja Kalabria p.n, 10000.Prishtina, Kosovo (ehajrizi@ubt-uni.net)

**IHRT, Vienna University of Technology, Favoriten Strasse 9/E325A6, 1040 Vienna, Austria (kopacek@ihrt.tuwien.ac.at)

Abstract: International development is critical if we are to stabilise previously unstable regions. The development of new, sustainable education systems in such regions is well known to be an important driver for international development generally, attracting considerable body of literature as well as numerous donor initiatives. Developing economies in the midst of fundamental restructuring of higher education may benefit from radical approaches to engineering education programme design.

This paper sets out the case of the development of an Engineering Management MSc program in Kosovo. It demonstrates that it is possible to develop higher-education programmes in advanced engineering, which have potential local economic impact in an emerging economy and are designed with that goal specifically in mind. The case demonstrates how it is possible to apply theories of engineering and technology professional competence to develop higher education programmes with the potential to deliver on aggressive economic and educational objectives probably as a model for frugal countries.

As an example a cooperation project between the University for Business and Technology (UBT) in Prishtina, Kosovo and Vienna University of Technology will be presented and discussed.

Keywords: International Development, International Stability, Engineering Education

1. INTRODUCTION

Today's engineering environment is more challenging than ever before. With today's increased technical complexity and competitive pressures, the breed of managers that has evolved must confront new problems in managing complex tasks.

To manage effectively in such a dynamic and often unstructured environment, managers must understand the interaction of technical, organizational and behavioural variables in order to form a productive engineering team. (Thamhain, 1992).

Fischer (2004) and Kopacek et.al. (2013) described the following key dimensions of educational competence:

1. Technical Competence: the individual has sufficient subject knowledge and can plan and organise so as to achieve maximum results.
2. Administrative Competence: the individual has a range of business knowledge, can follow rules, procedures and guidelines set out by the organisation and can perform to the expected standards set out by the organisation.
3. Ethical Competence: The individual has moral standards which guide them in their decision making activities in the work environment.
4. Productive Competence: The individual is efficient and capable of producing desirable results. Productive competence particularly focuses upon the capability of the professional to continuously develop their knowledge and skills.
5. Personal competence: The individual can manage time, possesses necessary 'people skills', time management, communications and conflict

management skills to operate effectively in the working environment .

2. ENGINEERING MANAGEMENT

In the past, the areas of engineering and management were regarded as two very different and unrelated areas. Trained specialists undertook the process and technical aspects of engineering, while a different type of person altogether, often with an unrelated background and experience, oversaw the management of an engineering business or technical processes.

Times have certainly changed; new skills and new approaches need a staff having the responsibility to make the most of their hi-tech processes. The need for a new kind of manager has been heightened by the new international nature of most businesses. There is an increasing demand from customers to deal with people familiar with the technical aspects of a product and who are also experts in business management and customer relationships (Kopacek et.al. 2013).

3. EDUCATION IN ENGINEERING MANAGEMENT

Therefore between 1992 and 1994 an Engineering Management Program as a co-operation between the Vienna University of Technology and Oakland University in Rochester, MI, USA were developed. The participants received the degree Master of Science in Engineering Management from Oakland University as well as an official certificate of Vienna University of Technology. The highlights of this 480 hrs program were:

"Master of Science – MSc." Degree and academic record of Oakland University; academic record and official certificate of Vienna University of Technology.

Executive program: 10 (12) 40 hrs. Modules (Friday morning to Tuesday evening) every 3-6 weeks in Austria and a two weeks stay in USA.

Combined American – European faculty (50: 50).

Two weeks in USA with company visits. At that time this program was unique in Europe.

The program was completely given in English.

Target groups were:

Graduates from technical and other universities with or without practical experience

Graduates from professional training schools (e.g. HTL, FH) with significant practical experience

Postgraduates from continuing education programs and graduates from special training programs with significant practical experience

Persons with similar qualifications

Until 2005 approximately 120 students were graduated in this program. More than 60% of these are now in high management positions in industry mostly abroad, 30% founded own successful companies.

In 2006 this program was included in the Department of “Continuous Education - CEC” of Vienna University of Technology and currently is running the 14th class.

A similar program, called “International Engineering Management – IEM” was organized 2002 in Prishtina (Kosovo) in cooperation with the “Institute for Enterprise Management and Education – IEME” nowadays “University for Business and Technology - UBT”.

IEM was the first postgraduate MSc program in Kosovo. The first program was started with 28 students and has continued successfully for more than six years.

The curriculum of the program almost was made based on the curriculum of the Engineering Management Program of Vienna University of Technology and Oakland University. Some additional topics were adapted according the demands of this region e.g. small and medium enterprises, service industry, telecommunication, banking sector. 60% of the curriculum consist of Management, Business and Law subjects the rest was engineering and technology. All Students who attended the program have now medium and high management positions.

Fischer (2004) compared 138 Engineering Management Programs worldwide. He recognised that the subject domain typically includes a combination of technical and non-technical subjects focussing upon general engineering. Furthermore there is a high demand for graduates with non-technical skills from these programmes, as compared with the skill profiles of graduates. This further suggests an imbalance in the profiles of the programmes as against the demands of the organisations that employ the graduates of the programmes.

4. EXPERIENCES

The main goal of the above design was to develop a curricula which would enable graduates to be conversant with business issues, and appreciate these in the context of the implementation of “new” technologies.

Therefore the contents are continuously adapted according to the newest developments and new subjects. Examples are business and engineering ethics (Stapleton and Hersh, 2004), Internet marketing, medical technologies, End of life (EoL) management; resource efficiency, Nano- and Femto-technologies, ubiquitous and cloud computing, complex system design and management.

According to the inhomogeneous pre-education of the participants it is important that some of the contents are ‘fun’ because for many prospective students, science and advanced technology courses are perceived to be extremely difficult and not inspiring. Consequently, it was felt that the programme needed to incorporate ‘edutainment’ i.e. to involve problems set in both an entertaining and educative context.

A well equipped laboratory for the technologic subjects and an excellent computer infrastructure are absolutely necessary. Therefore at UBT an engineering/mechatronics lab was installed and continuously improved (Kopacek, 2006).

The staff has to be international and a weighted compromise between academics and industrialists. In fact in the currently running Vienna EM program (engineering.tuwien.ac.at, 2014).

20% of the lectures a given by former graduates of this program.

The BSc and MSc theses must be supervised by the academic staff because staff members from industry have usually limited time and experience.

Selected MSc theses should be published and /or presented on scientific well recognized conferences. There are some from the Vienna EM program.

To offer the graduates the possibility to finish a PhD work.

Until now 6 from the Vienna EM program, 5 (3 already have finished) from the IEM program.

Teaching material should be available electronically and surprisingly also in hardcopy – preferably textbooks.

Private Universities:

Advantages of these institutions like UBT are:

Curricula’s developments are very fast and flexible without ‘administrative barriers’

Newest developments in special courses and seminars – length depends from the subject (2 – 40 hours).

Possibility to hire lecturers familiar with the latest developments from industry as well as from research. The problem is the didactic quality of such lecturers.

One of the main disadvantages is that top education cannot be cheap; for most of the interested persons such programs are too expensive.

Problems:

On a very fast growing education market it's more and more difficult to attract participants (quality versus quantity).

Usually the pre-knowledge of the participants, coming from different fields e.g. information technology, mechanical, electrical engineering, physics, economy, financing, social sciences, law, is very different and therefore the groups inhomogeneous. This requires that the lecturers have to adapt the contents from program to program.

Attendance of the participants. Many of them are involved in management position in small and medium enterprises and their presence is important in the company.

Academic writing and Research Culture by the participants coming from different areas and have more focus and interest on applied knowledge (Kopacek et.al. 2013).

5 THE NEW PROGRAM – EM KOSOVO

According to our long experiences mentioned above the new program was developed. The main goal of this program is to educate in an interdisciplinary way managers for SME's and departments of large companies for the "producing" industry.

5.1 Partners

Vienna University of Technology - Continuing Education Centre – CEC (cec.tuwien.ac.at, 2014)

The Vienna University of Technology is located in the heart of Europe, in a cosmopolitan city of great cultural diversity. For nearly 200 years, the TU Vienna has been a place of research, teaching and learning in the service of progress. The TU Vienna is among the most successful technical universities in Europe and is Austria's largest scientific-technical research and educational institution (tuwien.ac.at, 2014).

The Continuing Education Center (CEC) of the Vienna provides this outstanding MSc program and offers a widespread range of programs customized to the needs of graduates with technical or scientific backgrounds as well as the requirements of companies. With more than ten master programs and students from 65 countries and six continents, the CEC with a top faculty and international accreditations is facing the adventure of innovation and further education on a daily basis and is in tune with the times.

University for Business and Technology (UBT), Prishtina (www.ubt-uni.net, 2014)

UBT is a higher education institution in South East Europe combines all the advantages international universities. According to the long experience, UBT offer contemporary

study programs licensed and accredited according to international quality standards with internationally recognized degrees. Because of partnerships with universities and institutions from the EU and the USA the faculty include international academics and experts. This offers opportunities for professional studies and internships abroad. The organization and management of the University is in compliance with ISO 9001 which requires a modern infrastructure. Furthermore direct links to the economy in the framework of academic and international research projects yield to transfer of high technology know-how.

5.2 Target Groups

The target group mainly comprises:

Persons with a basis knowledge of engineering who work at the gateway between industrial economics and technology and those who want to operate in this area in the future.

Engineering and other technology graduates who aspire to management positions.

Established engineers working in the industry and faced with the challenge of new areas of responsibility following promotion to management positions.

Graduates with no special technology education having technical knowledge and skills but need to broaden their experience and update their expertise.

Persons with scientific, technological or appropriate business backgrounds, working in advisory and consultancy roles, who need to familiarize themselves with engineering management principles and practices.

5.3 Contents

The program is structured as follows (engineering.tuwien.ac.at, 2014)

Production Management

Probability and Statistics

Production Automation

Systems Engineering

Project Management & Logistics

Technology

Company visits

Engineering Informatics

Computing

IT in Production

Business Management

Accounting

Financing

Marketing

Operations Management

Management Information Systems

International Law

Human Factors

Master Thesis

The international faculty is combined from members of Universities in US, Ireland, Germany, Switzerland, Austria and International Companies.

5.4 Facts (engineering.tuwien.ac.at, 2014)

- The first MSc Engineering Management program at Vienna University of Technology started in 1995
- Highlights of our program are:
- 15 years experience, more than 130 graduates,
- Master of Science Degree of Vienna University of Technology
- Executive program
- International Faculty – Universities and Industry
- International Participants – until now from more than 25 different countries
- Part time – 14 weekend modules (Thursday to Sunday),
- According to the Bologna Convention,
- Teaching only in English,
- Contents modernized continuously,
- Evening Lectures of distinguished guest speakers,
- Company visits,
- Alumni Club related to IEEE,
- Regularly Club meetings for networking
- From our graduates approximately 2/3 are in (high) management positions in their previous but usually in new companies, 1/3 founded own companies.

6. SUMMARY

Instability in developing regions such as Kosovo is an important focal point for international-level policies aimed at sustainable development which promotes regional economic convergence. The European Union has already embarked upon processes of convergence together with neighbouring Balkan territories with the explicit aim of accession to the EU. There are mutual interests at work here which are explicitly aimed at continental socio-economic and political stability. This requires economic restructuring to create sustainable growth as quickly as possible, and education in domains such as advanced engineering are key pillars in such a policy. Without educational development the underlying conditions for economic development are rarely met (Kopacek et.al., 2013).

This case study demonstrates how new universities in less-stable regions can benefit from radical approaches to engineering education programme design. It clearly demonstrates how, through innovative pedagogical approaches plus international agency support that it is possible to develop higher-education programmes in advanced engineering, which have local economic context in an emerging economy.

Engineering management is an entirely new field and since the programme was launched has attracted several cohorts of students in a region which has very low levels of economic

activity. The authors show how it is possible to use theories of engineering and technology professional competence to develop a coherent programme which has the potential to deliver on aggressive economic and educational objectives.

Graduates of engineering management are rare in the labour market. They have learned how to combine the intensive technical knowledge of mechanical engineering, electronics and IT with management insights and skills. They are a new breed of graduates with interdisciplinary approaches and expertise, holding a core set of well developed technical skills.

They also take on major projects which have as outcomes concrete solutions to important engineering problems, worked out in practice in the laboratory which is unique in the region. Consequently they are well positioned to start up their own companies and can also take up work as a project manager or as a head of a department in a company in fields where engineering solutions are, or will shortly be, part and parcel of the innovation stream needed to energise the regional economy, fields such as Medical, Agriculture, Transportation, Mining etc.

The case study project recognized that education in engineering and technology management requires a departure from the “classical” higher education mentality. Key points are:

1. Incoming students must have a good basic general education including science, mathematics, economics, foreign languages (especially English) and related domains. This is a real challenge in Kosovo where the secondary and primary education sectors require significant developmental effort and where education quality is patchy at best, when compared to more developed economies in the European Union to which the region is seeking to accede.
2. Curricula need to be more flexible than in classical engineering programs in terms of student centered learning and module provision
3. Instructors need to be trained in and comfortable with delivery modes which go beyond didactic approaches. Problem centered learning (PBL) is particularly important for engineering management and students must experience PBL-type learning both within the classroom and at module level (in modules such as “the final year project”. This in turn implies a radical shift in educational culture and mindsets of instructors and students alike must be challenged and a new culture of student-centered learning inculcated.

7. OUTLOOK

The outlook is excellent but not without challenges. Kosovo as a region benefits from starting almost from scratch. This means that the educational system, especially in new private universities like UBT, is open to radical new ideas and approaches. Thirteen years after the war and five years after unilaterally declaring independence the region remains

economically very underdeveloped. Engineering education initiatives with the central goal of regional development are urgently needed.. This program could be a model for other frugal countries.

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